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Tilly et al.

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[54] **SINGLE WHEELSET RAILWAY TRUCK RIGID TRANSOM CONNECTED SIDEFRAMES**

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[73] Assignee: **AMSTED Industries Incorporated**, Chicago, Ill.

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[51] **Int. Cl.**[3] **B61F 3/00**; B61F 5/24; B61F 5/44

[52] **U.S. Cl.** ..... **105/165**; 105/199 S; 105/206 R; 105/208; 105/224 R; 267/4

[58] **Field of Search** ..... 105/165, 182 R, 199 S, 105/206 A, 206 R, 224 R, 268, 224 R; 267/4

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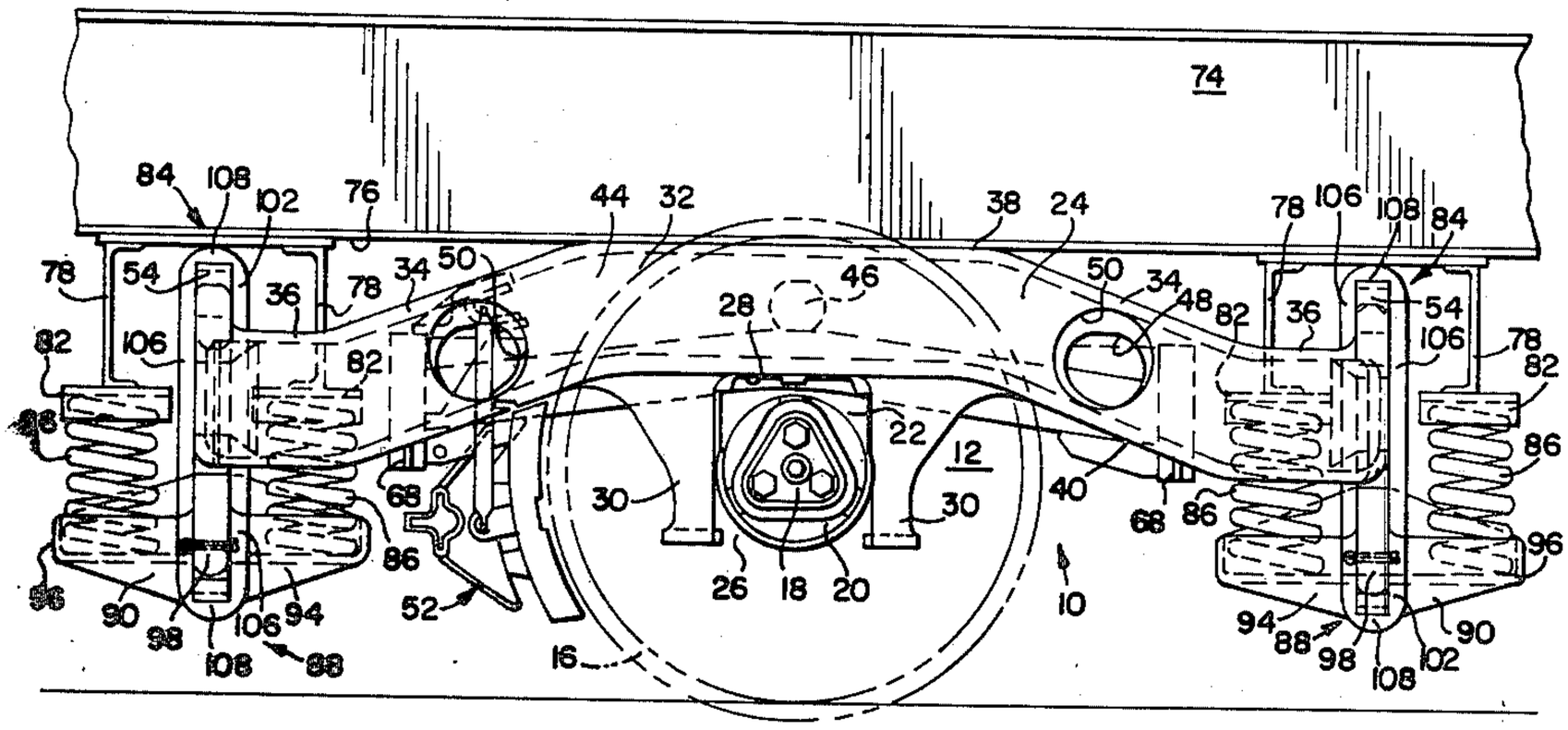
Assistant Examiner—Howard Beltran
Attorney, Agent, or Firm—Fred P. Kostka; Edward J. Brosius

[57] **ABSTRACT**

A railroad vehicle truck having a single wheelset includes a pair of spaced side frames. The side frames are joined into a rigid unit by a pair of transversely positioned transom cross bars. The cross bars are positioned one each on each side of the wheelset which has its axle ends journaled in bearings carried in turn in a pedestal jaw centrally formed in each side frame. Projecting inwardly from each end of the side frames is a bracket which forms part of a set of upper pivot connections with an upper end of a swing arm. A laterally positioned crosstie assembly is joined through a pair of spaced end caps with a lower end of each swing arm to form a set of lower pivot connections. Each crosstie assembly end cap has a pair of spring cups containing a set of springs which operatively support a body of the railroad vehicle thereabove.

5 Claims, 9 Drawing Figures



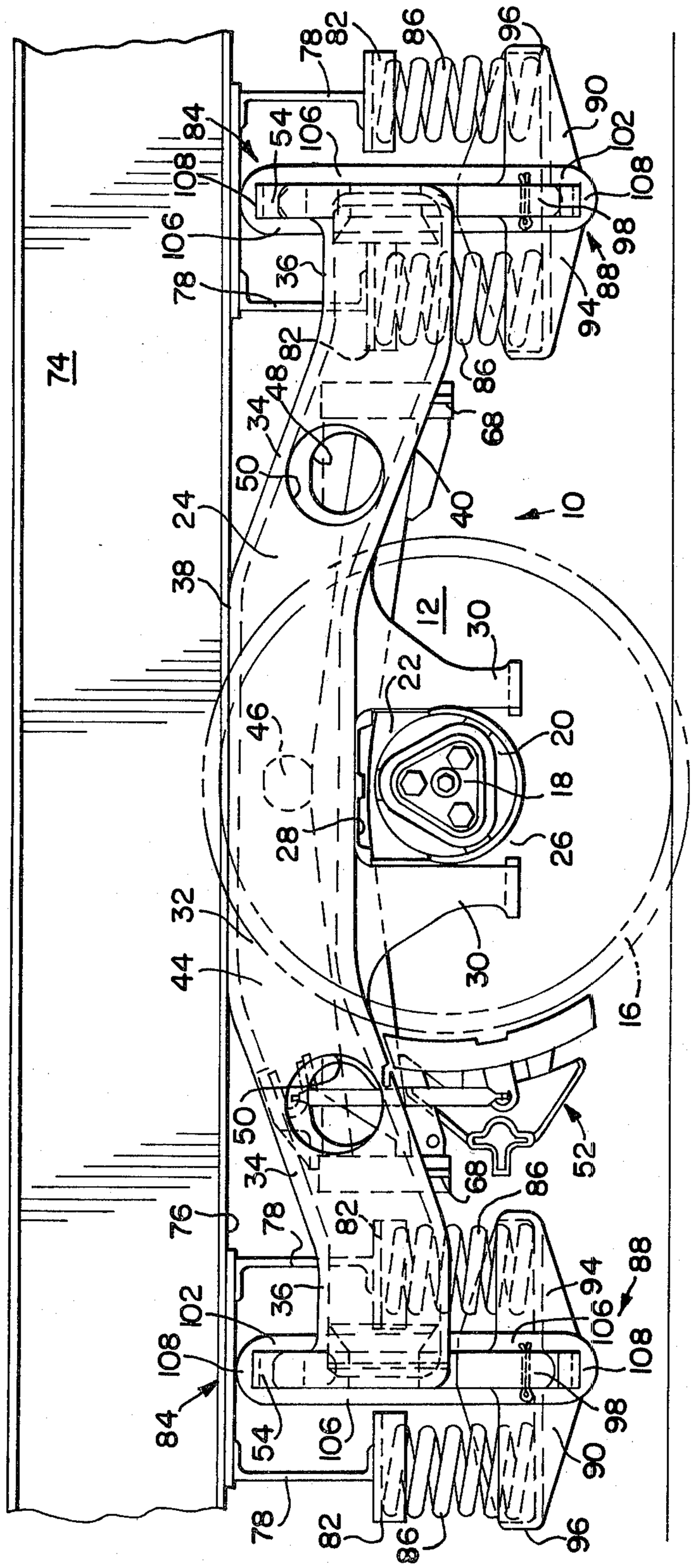

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FIG-1

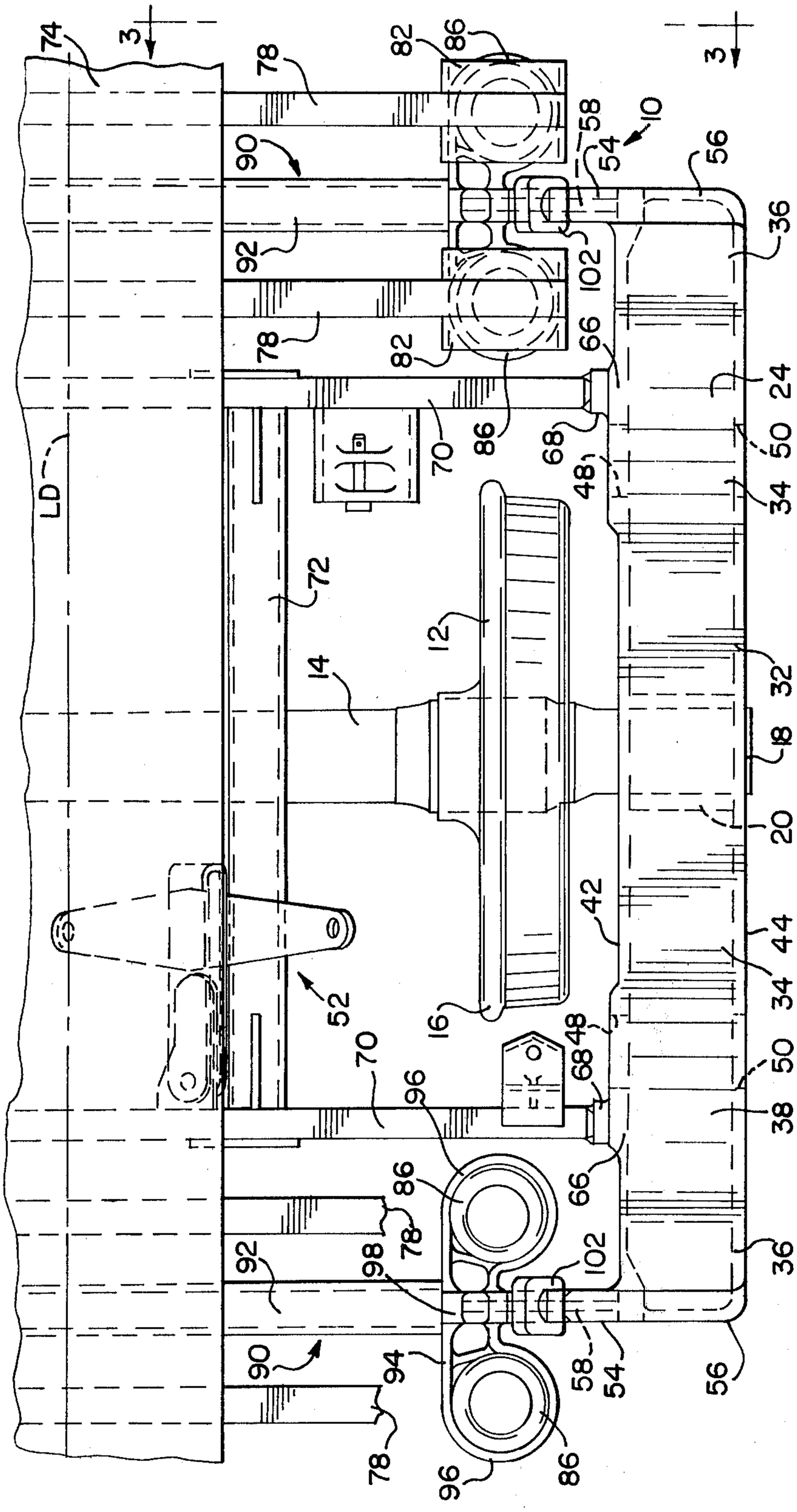
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FIG-2-

FIG. 3

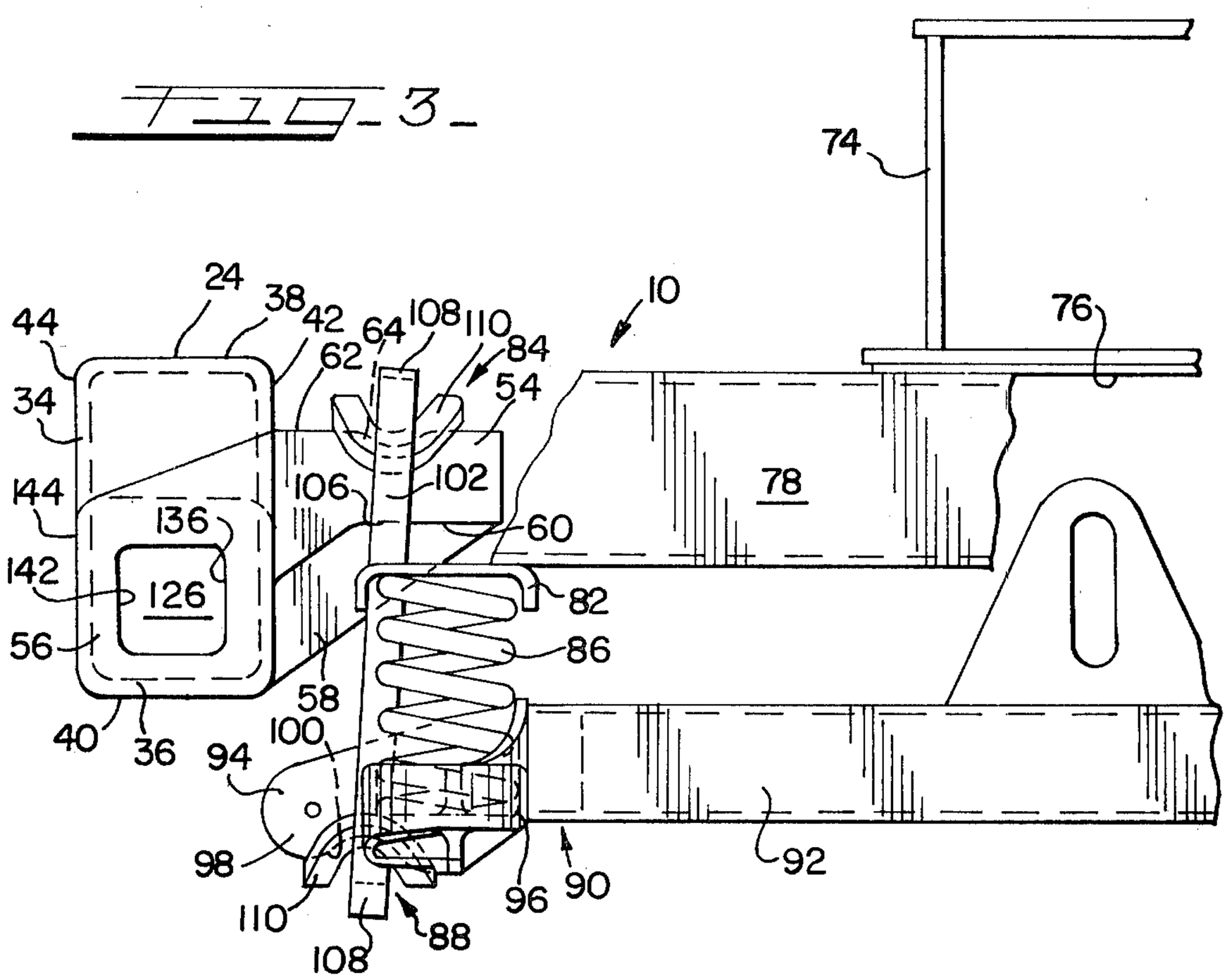
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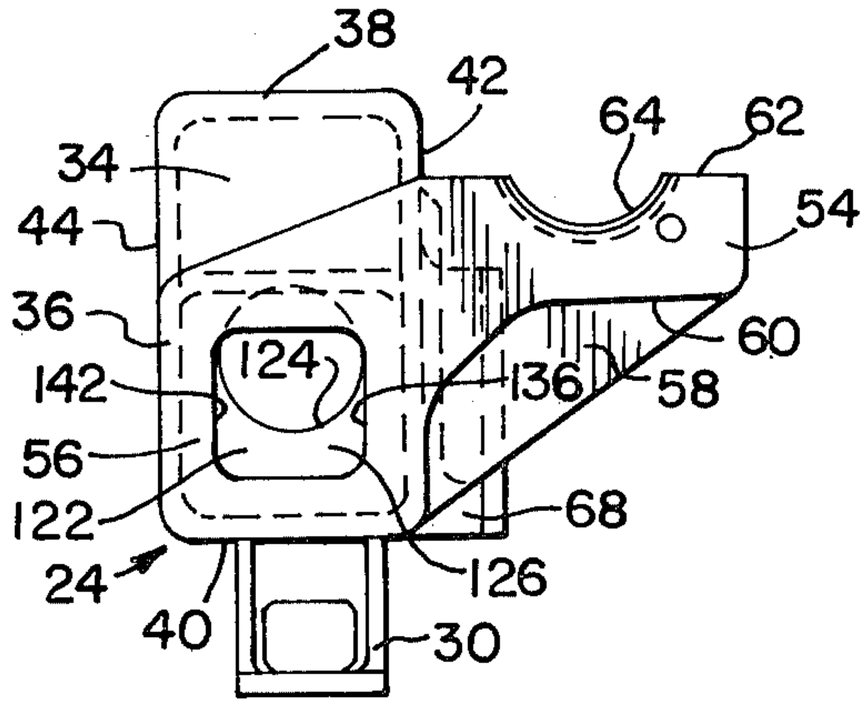
FIG. 6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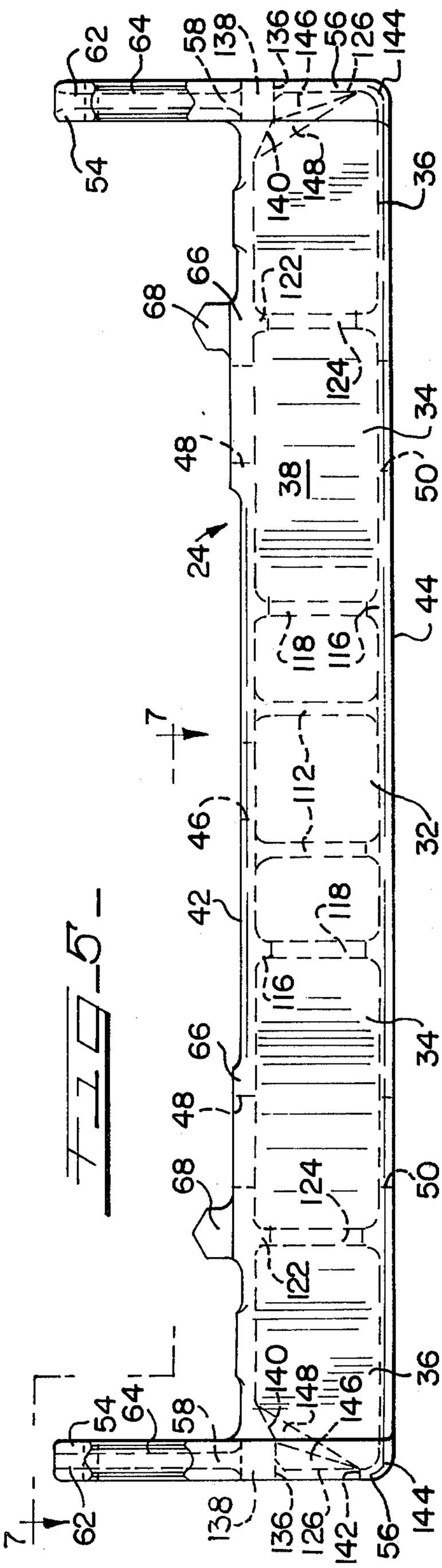
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FIG. 5

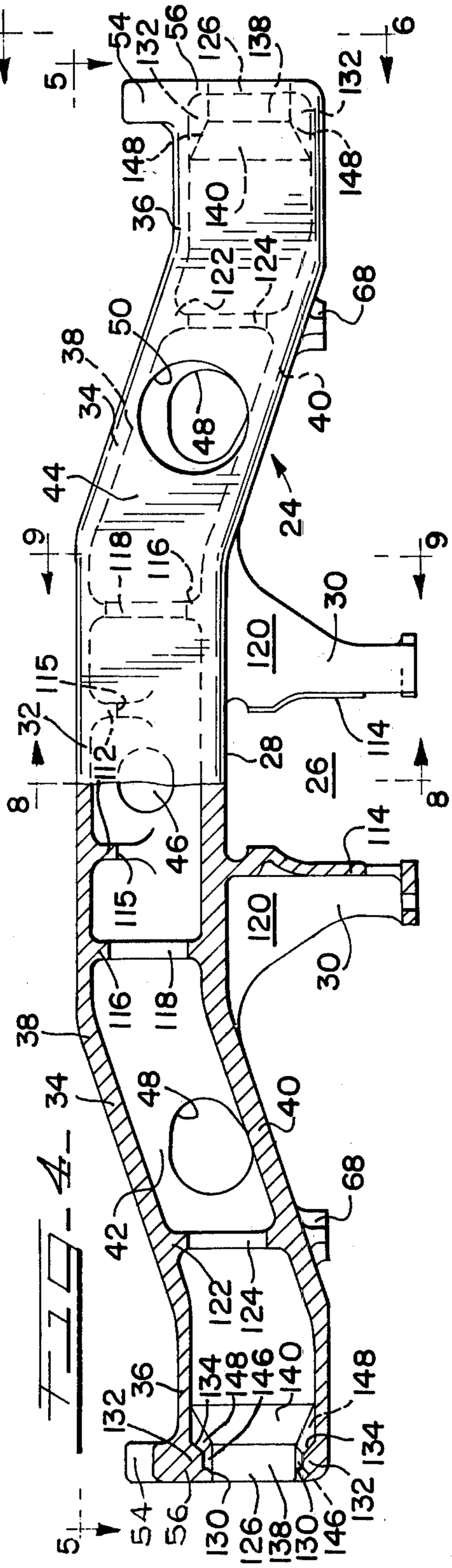
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FIG. 4

FIG. 7

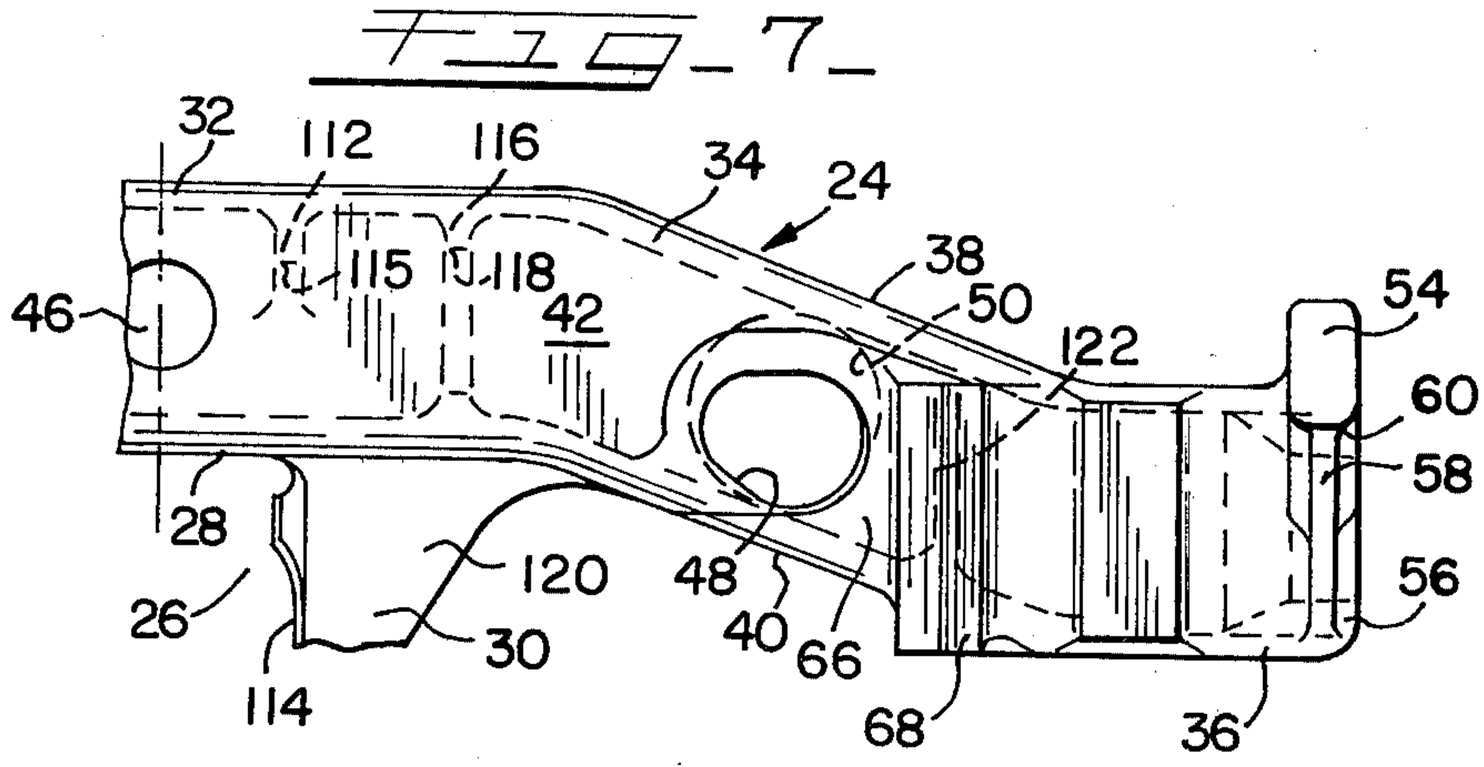


FIG. 8

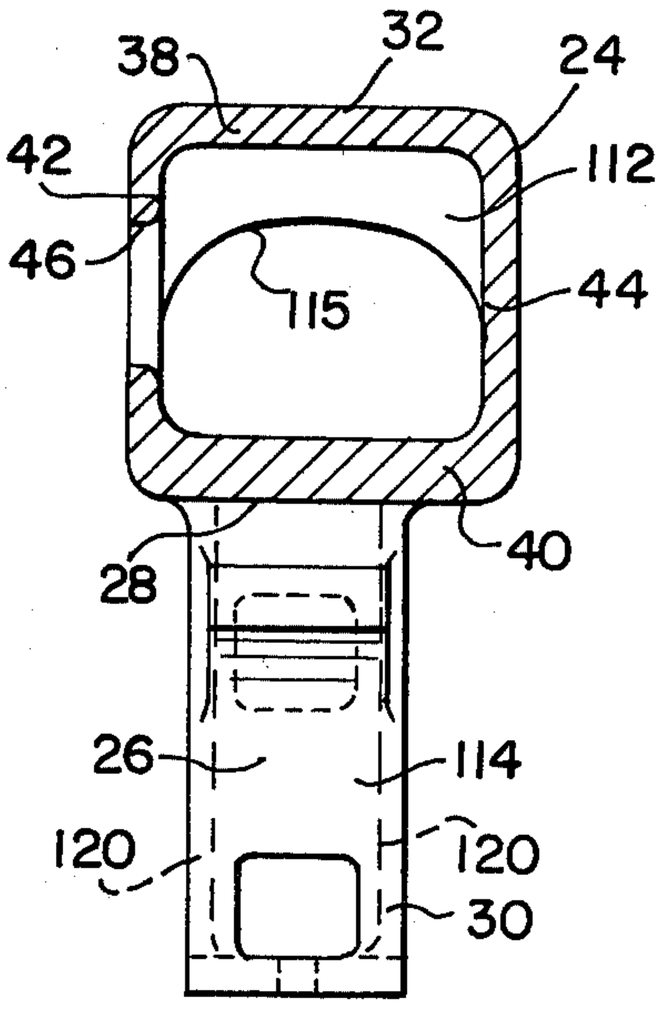
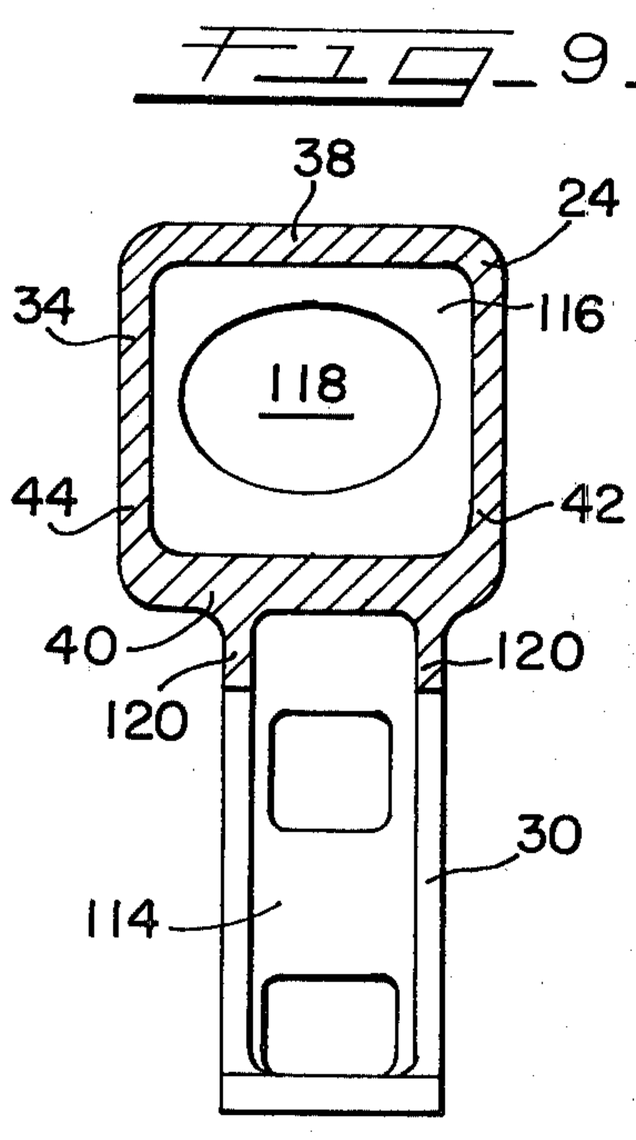


FIG. 9



SINGLE WHEELSET RAILWAY TRUCK RIGID TRANSOM CONNECTED SIDEFRAMES

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to trucks for railroad vehicles and more particularly to a truck having a single wheelset.

2. Prior Art

Traditionally, a truck for use with a railroad vehicle has at least a pair of spaced wheelsets and is commonly referred to as "a 4-wheel truck". Each wheelset comprises two wheels joined to a free axle wherein the wheels and respective axle rotate as a unit. Such trucks were developed to support considerable loads and today are available with rated capacities of 100 tons or greater.

When the railroad vehicle is not required to carry such heavy loads, for example in passenger service or piggy-back type service of automotive trailers or containers, then the load carrying capacity of the truck may be reduced substantially.

One suggested railroad vehicle truck particularly adapted for lighter loads includes a single wheelset. The wheelset has its axle ends rotatively journaled in bearings. The bearings in turn operatively connect through an adapter to a centrally located pedestal jaw integrally formed as part of each of a pair of spaced longitudinally positioned side frames.

At each side frame end is an inwardly projecting bracket which in turn pivotally supports an upper end of a swing arm. Positioned laterally between the front and rear swing arm pairs is a crosstie assembly. Each assembly has a pair of end caps which pivotally connect respectively with a lower end of each swing arm pair.

Because the upper side frame bracket-swing arm pivot connections are located apart at a lesser distance than the lower crosstie assembly end cap-swing arm pivot connections, the crosstie assembly is self-leveling. Each crosstie assembly end cap has a pair of cups which contain lower ends of set of springs. Upper ends of the spring sets are operatively connected to a body of the railroad vehicle and resiliently support such.

The railroad truck as described above in theory provides certain advantages over the traditional 4-wheel truck. First, the mass of the truck is reduced. This lesser mass between the track and the car body reduces track wear and reduces the energy required to move the railroad vehicle body associated with the truck. This mass can be further minimized by using components having an optimum strength-to-weight ratio.

The railroad vehicle truck as described, however, has not been built and tested to prove its ability to operate satisfactorily in the harsh environment of railroading. To evaluate the structural integrity of the design prior to actual fabrication and field testing, the various components were studied using computerized finite element analysis. This analysis revealed that the initial design of the side frames and crosstie end caps could be expected to fail when subjected to static and dynamic forces which the truck would typically encounter during use.

SUMMARY OF THE INVENTION

According to this invention there is provided an improved truck for a railroad vehicle; the truck has a pair of spaced side frames with each side frame having an elongated hollow configuration. Within the side frame

is a pair of spaced inner partial ribs located above a roof on a centrally located pedestal jaw formed as part of the side frame and including end portions extending downwardly therefrom; a pair of spaced intermediate ribs located respectively above the end portions of the pedestal jaw, and a pair of spaced outer ribs located respectfully between access openings formed in an inner and outer side wall of the side frame and end walls of the side frame with each inner access opening being located in a raised position formed in the inner side wall; the raised portions join the pair of outer ribs respectively with each outer rib being aligned with a boss formed on each raised portion.

The invention may be further provided to include each inner rib having a downwardly facing convex shaped bottom edge, each intermediate rib being provided with an oblong shaped opening and each outer rib having a round opening. Additionally, the end wall includes a square shaped opening with the end wall and outer side wall joining to form radiused corner having a thickness substantially equal to a thickness of the outer side wall.

This invention produces certain improved results. To appreciate these improved results it should be understood that a structurally sound side frame is provided by insuring that no portion of the side frame is stressed beyond a yield point of that particular side frame portion. Preferably all levels of stress within the side frame are maintained sufficiently below the yield point to afford a reasonable margin of safety. The level of such stress is directly proportional to the magnitude of the force applied to the side frame and is indirectly proportional to the physical configuration of the particular side frame portion. The magnitude of the force applied to the side frame cannot be readily changed without a major modification to the design of the truck. On the other hand, a mere increase in the mass of the side frame is contra to the objective of minimizing the mass of the truck.

The structural element as described above optimizes the side frame in that the side frame is structurally sound and the mass is a minimum.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation view of a railroad car truck incorporating this invention.

FIG. 2 is a partial plan view of the truck of FIG. 1 with a selective upper portion of the truck cutaway.

FIG. 3 is an end elevation view as seen generally along the line 3—3 of FIG. 2 with a selective portion of the truck cutaway.

FIG. 4 is a side elevation view partially in section of a side frame of the truck of FIG. 1.

FIG. 5 is a top plane view of the side frame as seen generally along the line 5—5 of FIG. 4.

FIG. 6 is an end elevation view of the side frame as seen generally along the line 6—6 of FIG. 4.

FIG. 7 is a side elevation view of the side frame as seen generally along the line 7—7 of FIG. 5.

FIG. 8 is a cross section elevation view of the side frame as seen generally along the line 8—8 of FIG. 4, and

FIG. 9 is a further cross section elevation view of the side frame as seen generally along the line 9—9 of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A railroad car truck incorporating this invention is shown generally in FIGS. **1–3** and designated **10**. The truck **10** includes a wheelset **12** comprising a free axle **14** with a pair of spaced wheels attached thereto. Only one such wheel **16** is shown in FIG. **2**. The structure of the truck **10** is symmetrical with respect to its longitudinal axis LD and therefore only one-half of the truck **10** is shown.

An axle end **18** of the wheelset **12** is journaled in a bearing **20** in a known manner. An adapter **22** operatively connects the axle end **18** and the bearing **20** to a side frame **24**. The adapter **22** is positioned within a pedestal jaw **26** defined by a flat roof **28** and spaced end portions **30**. The pedestal jaw roof **28** and end portions **30** are formed as an integral part of the side frame **24**. Note that the vertical axis of the pedestal jaw **26** is inwardly offset from a vertical axis of the side frame **24**, see FIGS. **6, 9**.

The side frame **24** has a gull wing-like configuration defined by a upper middle portion **32** which is joined at each end by downwardly sloped intermediate portions **34**. Ends of the sloped intermediate portions **34** in turn connect with lower outer portions **36**. The side frame **24** has a generally hollow cross section configuration, see FIG. **4**, comprising a top and bottom wall **38, 40** joined by spaced inner and outer side walls **42, 44**. Centrally located in the inner side walls **42** is an elliptical shaped opening **46**. Also in each side wall **42, 44** and located in each side frame intermediate portion **34** is an inner opening **48** having an oblong configuration and an outer opening **50** which has a round configuration. The openings **48, 50** provide access to brake rigging shown generally and designated **52**.

As best seen in FIGS. **3, 5**, and **6**, projecting inwardly from an end of each side frame outer portion **36** is a bracket **54** having an offset configuration. The bracket **54** is formed as an integral part of an end wall **56** of the side frame **24** and includes a vertical reinforcing rib **58**. The rib **58** joins a bottom surface **60** of the bracket **54** and the inner side wall **42** of the side frame **24**. A top surface **62** of each bracket **54** is formed with a radiused groove **64**, see FIG. **6**.

On the inner sidewall **42** of the side frame **24** is a pair of spaced raised portions **66** which extend about each inner opening **48** and include a rectangular shaped boss **68**. Attached to each boss **68** is an end of a transom cross bar **70**, see FIG. **2**. It should be understood that the cross bars **70** extend laterally across the truck **10** with an opposite end of each connecting with like boss formed on the other side frame (not shown). The cross bars **70** join the side frames into the rigid unit. To provide further stiffness, a pair of longitudinal bracing members connect the cross bars **70** with one such member **72** shown in FIG. **2**.

A body of the railroad vehicle (now shown in detail) may include a longitudinal underframing support **74** shown in FIGS. **1** and **3**. Affixed to a bottom surface **76** of the support **74** are two pairs of laterally positioned channels **78**. Attached to an outer end of each pair of channels **78** is a pair of upper spring cups **82** which contain upper ends of a set of coil springs **86**.

Positioned laterally on each side of the wheelset **12** is a crosstie assembly **90**. Each crosstie assembly **90** comprises a middle tubular portion **92** having its ends joined to spaced end caps **94**. Each end cap **94** is formed with a pair of spring cups **96** which in turn loosely hold lower ends of the set of springs **86**. Positioned between the spring cups **96** and attached thereto is a center block **98**. The center block **98** is formed with a downward facing radiused groove **100**, see FIG. **3**.

Each crosstie assembly **90** is operatively connected to the side frames by a pair of swing arms, and in FIGS. **1** and **2** for example, two of the four swing arms are shown and designated **102**. Each swing arm **102** has an elongated loop-like configuration defined by a pair of straps **106** which are joined together by upper and lower cross pieces **108**. Each cross piece **108** forms a seat for a bushing **110**, see FIG. **3**, which interfaces between the side frame bracket radiused groove **64** and the crosstie assembly end cap radiused groove **100** to form an upper and lower pivot connection **84, 88**. These pivot connections **84, 88** allow the crosstie assemblies **90** to swing laterally to accommodate like movements of the body of the railroad vehicle. Note that the upper pivot connections **84** are inwardly offset from the lower pivot connections **88**. This offset produces a self-leveling effect to dampen the swing action of the crosstie assemblies **90** transferred from like movements of the railroad vehicle body during travel thereof.

To best understand the construction of the side frame **24**, it is suggested that FIGS. **4–9** be viewed concurrently with the written description below.

The top and bottom walls **38, 40** of the side frame middle upper portion are generally horizontal with the bottom wall **40** being proximately 50 percent thicker than the top wall i.e. 1 3/16 in. v., ¾ in. thick. This greater thickness provides the bottom wall **40** with the necessary flexible strength for transferring dynamic and static loads between the wheelset **12** and the body of the railroad vehicle thereabove. Note that the bottom surface of this bottom wall portion serves as the roof **28** of the pedestal jaw **26**. The end portions **30** of the pedestal jaw **26** are formed integrally with and extend downward from the side frame bottom wall **40**.

The bottom wall **40** in the side frame sloped intermediate portion **34** also are made with this increased thickness while the bottom wall **40** of each outer end portion **36** has a reduced thickness proximating ⅝ in., for example. The top wall **38** of each sloped intermediate portion **34** is also made to this increased thickness while the top wall **38** of each outer end portion **36** has a reduced thickness of, for example, ⅝ in.

Within the side frame middle upper portion **32** and integrally joined to the top wall **38** and the side walls **42, 44** are a pair of partial inner ribs **112**. The partial inner ribs **112** are located one each equidistant on each side of a center of the side frame **24**. Each rib **112** is in proximate vertical alignment with an inner web member **114** of each pedestal jaw end portion **30**. Each rib **112** has a downward facing concave shaped bottom edge **115**, see FIG. **8**. Also within the side frame middle upper portion **32** and integrally joined to the top and bottom walls **38, 40** and the inner and outer side walls **42, 44** are a pair of intermediate ribs **116**. The intermediate ribs **116** are also located one each equidistant one each side of the center of the side frame **24**. Each intermediate rib **116** is formed with a substantially centrally located elliptically shaped opening **118**, see FIG. **9**. A major axis of the opening **118** is horizontal. Each intermediate rib **116** is located above outer ends of spaced flange member **120** which joined the inner web member **114** to form the pedestal jaw end portions **30**.

Lastly, there are a pair of outer ribs **122** located within the side frame sloped intermediate portions **34**. The outer ribs **122** are integrally joined to the side frame top and bottom walls **38, 40** and the inner and outer side walls **42, 44**. Each outer rib **122** is located an equidistant on each side of the side frame center and are in substantially horizontal alignment with the bosses **68** respectively. Each outer rib **122** is formed with a circular shaped opening **124** best seen in FIG. **6**.

Each side frame end wall **56** has a square shaped opening **126** defined in part by a top and bottom lip **130**, see FIG. **4**. The top and bottom lips **130** join a top and bottom segment **132**. The top and bottom segments **132** each have a tapered inner face **134** which merge with the top and bottom wall **38, 40** respectively. An inner vertical edge **136** of the end wall opening **126** in turn joins an inner side wall segment **138**. The segment **138** has a tapered inner face **140** which merges with the side frame inner side wall **42**. An outer vertical edge **142** of the end wall opening **126** joins with a thinned vertical corner section **144** which in turn merges with the side frame outer side wall **44**. Because the outer side wall **42** at the corner section **144** is thin while the top and bottom segments **132** and inner side wall segments **138** are substantially thicker, a pair of upper and lower triangular shaped surfaces **146, 148** are inwardly, and upwardly and downwardly formed.

During operation of the railroad vehicle which would include a set of the trucks **10** located one each at respective end of the vehicle, each truck **10** is subjected to dynamic and static forces. These forces are multidirectional in nature and produce shear, bending, tensile, compressive and torsional stresses in the various truck component.

One force which is substantially vertical in direction comprises a static component generated from a weight of the vehicle body and its related load. The other component of this vertical force is dynamic in nature and results from changes in the absolute and relative vertical location of the truck **10** and the vehicle body.

Also during travel of the railroad vehicle the railroad vehicle body rolls and pitches in response to changes in velosity and changes in direction, for example, about a curved section of track. Such rolling movements are translated in part into a sideway swinging or lateral oscillating movement of the vehicle body. These movements and related dynamic forces are transferred by the springs **86** to the crosstie assemblies **90** which may swing as provided by the upper and lower pivot connections **84, 88** between the side frame brackets **54**, the swing arms **102** and the crosstie assemblies **90** respectively. These rolling related forces also increase and decrease the dynamic component of the vertical force depending on the relative position of the crosstie assemblies as they swing from side-to-side.

All of these forces as noted are transferred by the crosstie assemblies **90** to the side frames **24** by the swing arms **102**. The side frames **24** in turn transfer such to the wheelset **12**. Note the points at which these forces are transferred i.e. lines of force, from the swing arms **102** to the side frames **24** are at the upper pivots **84**. On the other, the effective point of transfer i.e. line of force between the side frame **24** and the wheelset **12** is the side frame pedestal jaw **26**.

These lines of force are spaced apart longitudinally and laterally. The longitudinal spacing creates a force moment which produces bending stresses in the side frame **24**. On the other hand, the lateral spacing creates a force moment which produces torsional or twisting stresses in the side frame **24**. Note, however, that twisting of the side frame **24** is substantially limited to the lower outer end portions **36** because of the transom cross bars **70** resist any twisting of the sloped intermediate portions **34** and middle upper portion **32**. Within the inner side wall **42** and top and bottom walls **38, 40** the twisting forces and bending forces are in the same direction and thus accumulate to produce high levels of stress. Within the side frame outer side wall **36** the stress is at a reduced level because the twisting forces tend to cancel the bending forces being in the opposite direction. The accumulative bending and twisting forces are particularly accommodated by the raised portions **66** in the inner side wall **42** which join with the thickened top and bottom wall. Additional strength is provided by the outer ribs **122** which are aligned with the transom cross bars **70** to provide a continuous section between side frame outer side walls **44**. The inner openings **48** weaken the inner side wall **44**. However, the oblong configuration of each opening **48** minimizes this weakening effect. Lastly, the bottom wall **40** in the side frame middle upper portion **32** is subjected to localized stresses as the bottom wall **40** also serves as the pedestal jaw roof **28**. These localized stresses are accommodated by providing a free area above the bottom wall **40** in line with the pedestal jaw roof **28**. Note that the inner ribs **112** add substantial strength to this free area in the side frame middle upper portion **32** while allowing the bottom member **40** to flex as it engages with the adapter **22**. The outer ends of the pedestal jaw end portion **30** and respective side frame portions are substantially strengthened by the intermediate ribs **116**. Note also that the inner and intermediate ribs **114, 116** are useful to offset the torsional effect resulting from the pedestal jaw **26** being offset with respect to the body portion of the side frame **24**.

While various modifications may be suggested by those versed in the art, it should be understood that we wish to embody within the scope of the patent warranted hereon all such modifications as reasonably and properly come within the scope of my contribution to the art.

What is claimed is:

1. A side frame particularly adapted for use in a railroad car truck having a single wheelset, said side frame comprising,

a hollow, elongated body defined by spaced inner and outer side walls joined together by a top and bottom wall,

a bracket at each end of said body extending inwardly from end walls on said body,

said inner side wall formed with a pair of oblong shaped openings in spaced, sloped intermediate portions of said side frame to provide access to brake rigging of said truck, and

a pair of outer ribs formed within said body and integrally joined to said side walls and said top and bottom wall, one each of said pair of ribs located between said opening and said bracket respectively with each of said ribs in substantial alignment with a respective one of longitudinally spaced transom cross bars joining a pair of said side frames into a rigid unit.

2. A side frame as defined in claim **1** and further characterized by,

said oblong openings one of said pair being formed in each of a pair of spaced raised portions in said side

frame inner side wall with said raised portions extending toward said end walls to interface respectively between said outer ribs and a boss projecting from each said raised portion for connecting one each with ends of said transom cross bars.

3. A side frame as defined by claim 1 and further characterized by,

a pair of spaced partial ribs formed within said body and integrally joined to said side walls and said top wall of an upper middle portion of said side frame with one each of said inner ribs located equidistant from a center of said side frame and in proximate vertical alignment with an inner web member of pedestal jaw end portions joined to and extending downward from said side frame bottom wall.

4. A side frame as defined in claim 3 and further characterized by,

a pair of spaced intermediate ribs formed within said body and integrally joined to said side walls and said top and bottom wall with one each of said intermediate ribs located equidistant from said side frame center and in proximate vertical alignment with an outer end of each said pedestal jaw end portion.

5. A side frame particularly adapted for use with a single wheelset, said side frame comprising,

an elongated, hollow tubular body defined by an inner and outer side wall joined together by a top and a bottom wall with spaced end portions joined to said bottom wall to define in part a pedestal jaw to receive an axle end to said wheelset,

a pair of partial inner rib means located so that one of each is equidistant on each side of a center of said side frame and in substantial vertical alignment with an inner web member of each said pedestal jaw end portion, each of said inner rib means being integrally joined to an inside of said frame top wall and side walls,

a pair of intermediate rib means located one each equidistant on each side of said side frame center and in proximate vertical alignment with an outer end of said pedestal jaw end portions, each intermediate rib means joined to said inside of said side frame top and bottom wall and said side walls,

a pair of spaced raised portions formed as part of said side frame inner side wall, said raised portions positioned between said intermediate rib means and end walls of said side frame respectively with each said raised portion having an oblong-like shaped opening therein, and

a pair of spaced outer rib means located one each between said openings and said end walls respectively in substantial alignment with a transom cross bar joined to said inner side wall, each said outer rib means integrally joined to said inside of said side frame top and bottom wall and said side walls,

wherein said rib means transfer torsion and bending forces from said inner side wall to reduce an accumulation effect of said forces therein.

* * * * *